STANDARD REFERENCE DATABASES

MSEL offers 9 databases that contain information about materials properties. More detailed information and how to acquire them is provided through Standard Reference Data Program at the following e-mail address: http://ts.nist.gov.

- **NIST/Sandia/ICDD Electron Diffraction Database**

  Designed for phase characterization obtained by electron diffraction methods, this database and associated software permit highly selective identification procedures for microscopic and macroscopic crystalline materials. The database contains chemical, physical, and crystallographic information on a wide variety of materials (over 81,534) including minerals, metals, intermetallics, and general inorganic compounds. The Electron Diffraction Database has been designed to include all the data required to identify materials using computerized d-spacing/formula matching techniques.

- **NACE/NIST Corrosion Performance Databases - Metals**

  COR-SUR® for Windows is a complete revision of the COR-SUR and COR-SUR2 (DOS) programs and their companion volumes, Corrosion Data Survey, Metals and Nonmetals Sections. Necessary corrections and additions have been made after a thorough appraisal by the editors and selected reviewers. When a specific chemical environment and metal combination is entered, as well as the chosen data format, the user is first presented with a brief description of the chemical, with any relevant ancillary information. If the user should select a hazardous combination of metal and environment or a chemical in which ingress of air or oxygen may be controlling, the hazard information is automatically displayed before the corrosion data are accessible. This is a necessary precaution against an inexperienced user choosing a combination which might be dangerous to personnel or equipment. The user is then presented with the data in either conventional tabular or graphic form.

- **NACE/NIST Corrosion Performance Databases - Nonmetals**

  COR·SUR® for Windows is a complete revision of the COR·SUR and COR·SUR2 (DOS) programs and their companion volumes, Corrosion Data Survey, Metals and Nonmetals Sections. Necessary corrections and additions have been made after a thorough appraisal by the editors and selected reviewers. Both the printed volumes and the COR·SUR and COR·SUR2 (DOS) programs have been widely distributed and used successfully as information helpful in materials selection for specific chemical service. The revision was deemed necessary not only to add new information concerning chemicals, alloy families and specific alloys, but also to correct certain inaccuracies and omissions in the previous editions. COR·SUR® for Windows has been designed to enhance its usefulness as a tool for materials selection. The tables and graphs produced by the program provide a cost-effective method for

quickly reducing the field of choice of materials of construction for particular applications, based on corrosion behavior.

- **NACE/NIST Corrosion Performance Databases: Metals and Nonmetals**

  COR·SUR® for Windows is a complete revision of the COR·SUR and COR·SUR2 (DOS) programs and their companion volumes, Corrosion Data Survey, Metals and Nonmetals Sections. Necessary corrections and additions have been made after a thorough appraisal by the editors and selected reviewers. Both the printed volumes and the COR·SUR and COR·SUR2 (DOS) programs have been widely distributed and used successfully as information helpful in materials selection for specific chemical service. The revision was deemed necessary not only to add new information concerning chemicals, alloy families and specific alloys, but also to correct certain inaccuracies and omissions in the previous editions. The previous list of 25 alloy groupings has been expanded to 37 to accommodate the 14% silicon cast irons, which had been dropped from the fifth edition of the text, as well as modern alloy developments in the stainless steel, uperaustenitic and nickel-chromium-molybdenum group. There are nearly 1,000 corrosive environments represented in the metals corrosion database. For the metals corrosion data, four performance ratings are used: < 0.05 mm/y (< 2 mpy), <0.508 mm/y (< 20 mpy), 0.0508-1.27 mm/y (20-50 mpy), and > 1.27 mm/y (> 50 mpy).

- **NIST Crystal Data**

  NIST Crystal Data contains chemical, physical, and crystallographic information useful to characterize more than 237,671 inorganic and organic crystalline materials. The data include the standard cell parameters, cell volume, space group number and symbol, calculated density, chemical formula, chemical name, and classification by chemical type. The database can be utilized as a practical analytical tool for compound identification because the lattice/formula combination characterizes a crystalline phase. The database is useful in conjunction with other data for materials design and properties prediction. The file includes reliable data across the entire range of solid state materials including inorganics, organics, minerals, intermetallics, metals, alloys, drugs, antibiotics, and pesticides. Comprehensive chemical, crystallographic, and identification search software is available with the database.

- **NIST Structural Ceramics Database (SCD): Version 3.0**

  The NIST Structural Ceramics Database (SCD) provides evaluated materials property data for a wide range of advanced ceramics known variously as structural ceramics, engineering ceramics, and fine ceramics. These materials tend to have low mass densities and high strengths and tend to be resistant to corrosion. These characteristics form the basis for applications of these materials in high-temperature, energy-efficient heat exchangers, advanced engine designs, bearings, wear resistant parts, and stable electronic substrates and electronic packaging.

- **Phase Equilibria Diagrams Database: Version 2.1**

  Version 2.1 of this PC Windows(TM)-based CD-ROM package provides improved access to the well-known and widely distributed Phase Equilibria Diagrams Database (PED). The software permits searches for diagrams by chemical system, author, or year of publication. The database includes all diagrams from Volumes 1-10, annual volumes for 1991-93, and Phase Equilibria Diagrams (PED) for High-Tc Superconductors in the PED series. The graphics software permits diagram manipulation for Volumes 5-10, such as magnification of selected regions, overlays of related diagrams, lever rule calculations, display of the cursor position in real units, conversion from mole % to weight % and vice versa for diagrams. In addition, all bibliographic references and chemical systems from the volumes of the PED series are available.

- **NIST/NRIM High Temperature Superconductors Database: Version 2.0**

  The database of materials properties provides evaluated property data for high temperature superconductors. The range of materials covers the many series of compounds derived from the Y-Ba-Cu-O, Bi-Sr-Ca-Cu-O, Tl-Sr-Ca-Cu-O and La-Cu-O chemical families, along with numerous other variants of the cuprate and bismuthate, and borocarbide materials that are known to have superconducting phases. The materials are described by specification and characterization information that includes processing details and chemical compositions. Physical characteristics such as resistivity and crystal structure are given in numeric tables. The material properties include superconductor characteristics (Tc, jc, Hc2,etc.), thermal properties (conductivity, expansion, specific heat), mechanical properties (elasticity, strength, toughness), and crystallography (cell parameters, atomic coordinates), methods, procedures, and conditions. Data have been collected from papers published in the years 1987-1996 and evaluated in terms of materials characterization and how experimental conditions have been controlled. In all cases, the sources of the data are fully documented in a comprehensive bibliography.

- **NIST Database on Reinforcement Permeability Values: Data on Composite Reinforcement Materials Used in Liquid Composite Molding**

  This database supports the design and implementation of liquid composite molding (LCM) and serves as a repository for permeability measurements. Version 1.0 contains more than 100 data points measured at NIST for different woven, random, unidirectional, and stitched glass fabrics. Fiber volume fractions range from about 10% to over 55%. Data were measured with saturated, unsaturated and thru-thickness techniques. The data currently included were generated by unidirectional saturated flow or radial unsaturated flow techniques. The unidirectional experiments also include a number of thru-thickness measurements.

- **Database on Lead-Free Solders**

  MSEL's Materials Reliability Division in working with the Metallurgy Division, the Colorado School of Mines, and the National Electronics Manufacturing Initiative (NEM) to expand a database on the properties of lead-free solders. With product cycle time being slashed to keep up with consumer demand and competitive pressure, new electronic products are going directly from computer-aided design to full-scale production. The worldwide movement in the electronics industry to replace lead-tin eutetic solders with lead-free solders creates a need for critical data on the industry's new lead-free solder compositions for these design and reliability models. The team is working with the NEMI Lead-free Alloy Task Group to gather existing physical and mechanical property data that have been developed by researchers around the world into a single database. In addition, the team is working with NEMI to develop a list of missing high-priority data, with the list serving as a roadmap for research in lead-free solders. NIST and NEMI are planning to host a joint national workshop on these issues. The most recent version of the database is posted on the Materials Reliability Website at: http://www.boulder.nist.gov/div853/eudora="autourl". The team plans to add additional data and to critically evaluate more of the existing data each month.